COMPARATIVE STUDY OF YOGA AND AEROBICS EXERCISE ON SELECTED PSYCHOLOGICAL VARIABLES IN ENGINEERING COLLEGE STUDENTS

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ABSTRACT

The purpose of the study is to make comparison of yoga and aerobic exercise on selected psychological variables in engineering college student. It is an accepted fact that yoga and aerobics exercises are basic requirement and foundation to maintain the psychological variables stress and anxiety that is beneficial for any type of sports and healthy social living. Since, in every sports technical, tactical task and elements are distinctively different the nature and the level of stress and anxiety control ability will also be of different level.

We genuinely felt that which exercise plays a critical role to control the stress and anxiety more effectively. So it is required to be investigated in depth and detail to understand its implication and compare the yoga and aerobics very specifically for training and performance.

Considering above, we narrowed down the conceptualization of research on comparison of yoga and aerobics exercises on the basis of psychological variables stress and anxiety and keeping the primary objective of the research as prime focus. And the study is titled as "Comparative Study Of Yoga And Aerobic Exercise On Selected Psychological Variables In Engineering College Students".

Method Employed For Collection of Data
The data were analyzed using statistical tools t-test, ANCOVA and MANCOVA through the software SPSS 21.0. Results from these tests aim to test the hypothesis developed by the researcher and accordingly support or refute it.

KEYWORDS: depression, anxiety, quality of life, aerobics, yoga ,stress.

Introduction

As a primary objective of exercise, the attainment of total fitness has over whiling implications for growth and development of youth. The sensible organic ingredients of physical fitness include muscular strength, muscular endurance, muscular power, muscular flexibility, cardio- vascular endurance or cardio respiratory fitness and neuromuscular fitness.

Yoga is a science of righteous living and it works upon its integration in our daily life. It works on all aspects of the person which are physical, mental, emotional, psychic and spiritual. The word yoga means 'unity' or 'oneness' and is derived from the Sanskrit word 'yuj' which means 'to join'.

Aerobics is a form of physical exercise that combines rhythmic aerobic exercise with stretching and strength training routines with the goal of improving all elements of fitness (flexibility, muscular strength, and cardio-vascular fitness). It is usually performed to music and may be practiced in a group setting led by an instructor (fitness professional). Although, it can be don individually and without musical accompaniment.

With the goal of preventing illness and promoting physical fitness, practitioners perform various routines comprising a number of different dance- like exercises.

The quantitative analysis focuses on the evaluation of the data collected from the survey of 120 engineering college students belonging to Sharda College of Engineering, UP, in order to understand the pre and post effective changes of Yoga and Aerobic on Stress and Anxiety. Descriptive (Paired sample t-test) and Inferential (ANCOVA and MANCOVA) statistics were performed on the data using SPSS 21-0 software.

Hypothesis 1[N]: There will be no significant difference in Yoga and Aerobic exercises on selected psychological variables among engineering college students

Hypothesis 1[A]: There will be significant difference in Yoga and Aerobic exercises on selected psychological variables among engineering college students

The data was collected for each variable by administering their respective questionnaire according to their given norms and keys. The experts and subjects were consulted personally and their sincere cooperation was solicited. Respondent were called to common place, and had enough time for filling the questionnaire. Necessary instructions were given to the subjects before filling the questionnaire.

Measures: for the data collection from stress questionnaire developed by "Ministry of Social Security, National Solidarity & Reform Institutions" following answers, scores and keys are given as follows:

Never: 0
Rarely: 1
Sometimes: 2
Often: 3
Very Often: 4

Interpretation of Scores is listed as follows:

0 - 20: Good control over stress.
21 – 40: Low level of stress.

41 – 60: Medium level of stress: Should reconsider means of coping with stress.

61 – 80: High level of Stress: Needs Counseling.

Measures: for the data collection from anxiety questionnaire developed by "William W.K Zung. A rating instrument for anxiety disorders. Psychosomatics 1971

Zung Self-Rating Anxiety Scale (SAS)" following answers, scores and keys are given.

None or a little of the time, some of the time, good part of the time and most of the time. 1 to 4 marks scale norms according to the questions to given answers were assigned and marks were changed according the questions.

For evaluation, all statements have been answered were checked for answers. Respective values for each response to get the total score were added.

Interpreting the Score A Score Total of 60 and over suggests the need for further medical assessment of GAD.

0 - 20: Good control over anxiety.

21 – 40: Low level of anxiety.

41 – 60: Medium level of anxiety: Should reconsider means of coping with anxiety.

Delimitations of the study

- The study was delimited to the one hundred twenty (120) randomly selected engineering college students.

- The study was further delimited to the selected psychological variables

- Stress

- Anxiety

The study was further delimited to selected yoga & aerobic exercises
- Yoga – Mindfulness meditation

- Aerobic – Running exercisesLimitations of the study

- Daily routine, food habits and social background of the subjects, which would effect on the study was considered as the limitation of the study.

- Any bias that was existed due to insincere responses from the subjects was considered as another limitation for the study.

- The questionnaire was used for the study for collection of necessary data was considered as another limitation of the study.

Procedure
Paired Sample T-test Results

Dependent Variable	Independent Variable
Stress	Yoga
Anxiety	Aerobics

The Paired-Sample t-test was performed in order to compare the differences of the impact of Yoga and Aerobics (independent variables) on the Stress and Anxiety (dependent variables) of the surveyed students, by comparing the mean values of both the measurements. As evident from the SPSS results, the mean values for Pre-experiment stage were higher for all three groups, Yoga, Aerobics and Control as compared to post-experiment stage (except for Control group for Anxiety which shows no significant difference) (Table 4.1). This could be inferred as that in almost all cases, the implementation of either of the two physical intervention programs: Yoga or Aerobics was effective on the Stress and Anxiety levels of the student.

Table 4.1: Paired Samples Statistics

Pair	Study Group	Mean	Standard Deviation
Pair 1	Stress Yoga Pre	46.950	3.27344
	Stress Yoga Post	23.425	6.09703
Pair 2	Stress Aerobics Pre	47.450	2.81889
	Stress Aerobics Post	32.700	8.13098
Pair 3	Stress Control Pre	47.750	2.50896
	Stress Control Post	38.825	6.71732
Pair 4	Anxiety Yoga Pre	46.225	3.17432
	Anxiety Yoga Post	22.650	5.18652
Pair 5	Anxiety Aerobics Pre	46.575	2.62031
	Anxiety Aerobics Post	36.3750	9.58280
Pair 6	Anxiety Control Pre	47.250	2.58943
	Anxiety Control Post	46.925	2.96464

Furthermore, since the pre values of Yoga, Aerobics and Control are almost similar, it could be inferred that the random sampling ensured similar baselines at the start of the experiment and hence made the overall findings and entire study reliable. Closer observation of the mean values of the variables point out to low levels for Anxiety (22.650) and Stress (23.425) Post-Yoga as compared to the rest, clearly indicating that Yoga is most the effective in the current study, for both the psychological variables selected. In the case of the Control group, it was observed that there is a significant drop in the levels of both Stress and Anxiety. Since Control group did not undergo any form of intervention, the drop in levels can be because of certain environmental factors, beyond the control of the researcher like exams, college festivals, vacations etc.

Evidently, the Standard deviation (SD) values of all study groups show that groups with lowest SD values belonged to the Pre-intervention groups, corroborating with the earlier inference of a similar baseline in the pre-intervention study condition thereby assuring further reliability to this study (Table4.1). Furthermore, standard deviation values were the highest in the post intervention period for the Aerobics group for both Stress (8.130) and Anxiety (9.582) variables, which could be inferred as varying degrees of impact of Aerobics when compared to lesser variance for Yoga and Control group.

Finding 1:
Subsequent correlation analysis studies on the research group data show that the highest correlation was observed for the Control group (α=.647) for its effect on Anxiety and Yoga group (α= .261) on its effect on Stress (Table 4. 2). Furthermore, the effect of both Yoga (α= -.190) and Aerobics (α= -.103) on Anxiety showed negative correlation, which suggests that Anxiety has no significant correlation with Yoga and Aerobics. This observation contradicts previous finding of significant positive effect of both Yoga and Aerobics on Stress and Anxiety levels. This contradiction led the researcher to conduct further tests to study the effect of these exercises in detail further, for clarification.

Table 4.2: Paired Samples Correlations

| Pair	Study Group	Pearson Correlation	Significance
Pair 1	Stress Yoga Pre & Stress Yoga Post	.261	.104
Pair 2	Stress Aerobics Pre & Stress Aerobics Post	.041	.803
Pair 3	Stress Control Pre & Stress Control Post	.006	.968
Pair 4	Anxiety Yoga Pre & Anxiety Yoga Post	-.190	.241
Pair 5	Anxiety Aerobics Pre & Anxiety Aerobics Post	-.103	.528
Pair 6	Anxiety Control Pre & Anxiety Control Post	.647	.000
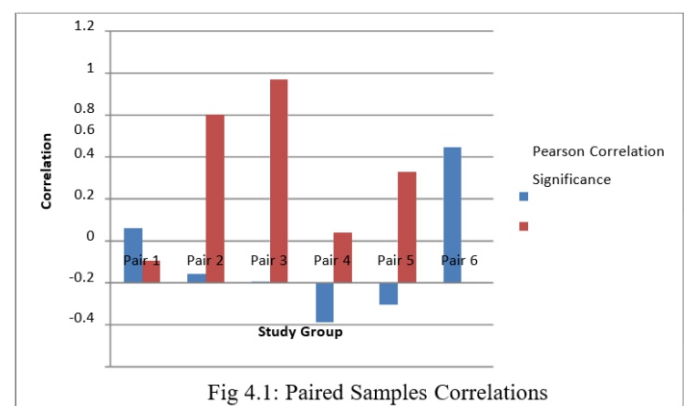
Fig 4.1: Paired Samples Correlations

Table 4.3: Paired Samples Test

Pair	Group	Mean	SD	Std. Error Mean	Paired Differences 95% Confidence Lower	Upper	t	df	Sig.
Pair 1	Stress Yoga Pre - Stress Yoga Post	23.525	6.12263	.96807	21.56689	25.48311	24.301	39	.000
Pair 2	Stress Aerobics Pre - Stress Aerobics Post	14.75	8.49661	1.34343	12.03265	17.46735	10.979	39	.000
Pair 3	Stress Control Pre - Stress Control Post	8.925	7.15537	1.13136	6.63660	11.21340	7.889	39	.000
Pair 4	Anxiety Yoga Pre - Anxiety Yoga Post	23.575	6.57457	1.03953	21.47235	25.67765	22.678	39	.000
Pair 5	Anxiety Aerobics Pre - Anxiety Aerobics Post	10.2	10.1910	1.61134	6.94076	13.45924	6.330	39	.000
Pair 6	Anxiety Control Pre - Anxiety Control Post	.325	2.35761	.37277	-.429	1.079	.872	39	.389

From the Paired Samples test (Table4.3), Yoga shows a higher mean difference as compared to Aerobics, for its effect on both Stress (23.525) and Anxiety (23.575). This can be inferred as Yoga being more effective in decreasing the stress and anxiety levels in students than Aerobics. The findings corroborate the initial findings of post-Yoga showing more impact (mean values) than Aerobics and Control. Lower value in the present case stands for lower anxiety/ stress levels in the surveyed respondent.

The significance values of the Paired Samples test shows high significance for all (p< .001) except the Control group (p= .389) for effect on Anxiety, suggesting that the correlation and t-statistics values hold significant for all except the Control Anxiety group and hence adds significance to the correlation findings.

Overall, it can be inferred from the t-test analysis that Yoga is comparatively more effective than Aerobics over Stress and Anxiety both as seen from the mean values as well as mean Differences values of the Paired Samples t-test. However, certain contradiction exists within the test. In case of the Significance values (Table4.2), only the Control group for effect on Anxiety shows to be highly significant (p= .000). For the rest of the values, all are found to be insignificant, especially the Aerobics and Control group for effect on Stress (p= .803 and p= .968 respectively). This observation is in contradiction to the earlier findings of Yoga and Aerobics showing positive effect on both Stress and Anxiety. This contradiction could most probably be because of not treating the control group values properly, during the pre and post comparison For the purpose of clearing this confusion, further statistical tests have to be performed, wherein the control groups are treated appropriately for correct findings. Both the ANCOVA and MANCOVA tests was performed for this case.

MANCOVA test

Dependent Variable	Independent Variable (Training Groups)
Pre-Intervention	Yoga Anxiety
	Aerobic Anxiety
	Control Anxiety
Post- Intervention	Yoga Stress
	Aerobics Stress
	Control Stress

This multi-variety test was performed to study the effect of independent variable(s) on the combined effect of the dependent variables, by means of measuring the co-variance values (Mayers 2013). MANCOVA differs from ANCOVA in that instead of a single dependent variable, two or more dependent variables are examined simultaneously for their relationship with one or more independent variables, but accounts for one or more co- varieties. Covariates are the variables that account for certain extraneous variations observed in the data, which in this case is the values of the Control group (Mayers 2013). This is done by reporting the calculated outcomes, mainly of four types, Wilks' Lambda, Hotelling's Trace, Pillai's Trace and Roy's Largest Roots, which are also dependent on their significance values (Mayers 2013)

In the present test, the effect of the one of the two independent variables, Yoga and Aerobics are studied on the two dependent variables selected, Stress and Anxiety, in order to analyze in depth the relationships

between them. In the previous t-tests, certain contradictions arose (effect of Yoga on Stress and Anxiety and its significant correlational values) which has been addressed in the present test. Following analysis on SPSS, the Descriptive Statistics, Multivariate Test and Pairwise Comparison tests will be expanded upon and the results inferred appropriately.

In the case of Descriptive statistics, the mean values as well as Standard deviation values of different training groups, for both pre and post interventions are compared. As seen from Table 4.4, the Yoga training group for both Stress (pre= 61.95, post= 23.425) and Anxiety (pre= 64.00, post= 22.65) showed maximum difference. Comparatively, Aerobics showed lesser impact on both Stress and Anxiety, while the Control group showed almost no change post interventions. This observation adds credibility to the previous findings of the t-test results, that Yoga is comparatively more effective on Stress and Anxiety levels as compared to Aerobics and Control group of the case engineering college.

Table 4.4: Descriptive Statistics for MANCOVA

Interval	Different Training Groups	Mean	SD	N
Pre	Yoga Anxiety	64.00	6.99084	40
	Aerobic Anxiety	59.85	7.65791	40
	Control Anxiety	60.925	6.56872	40
	Yoga Stress	61.950	8.85481	40

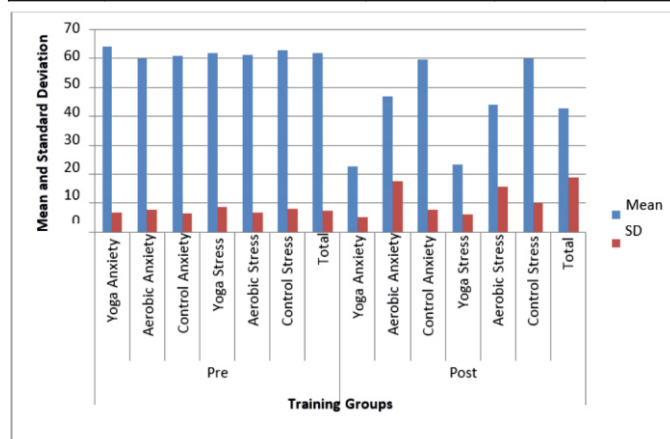|	Aerobic Stress	61.2000	6.74138	40
	Control Stress	62.850	7.95033	40
	Total	61.7958	7.54540	240
Post	Yoga Anxiety	22.6500	5.18652	40
	Aerobic Anxiety	46.8750	17.7275	40
	Control Anxiety	59.8000	7.72342	40
	Yoga Stress	23.4250	6.09703	40
	Aerobic Stress	44.1250	15.62081	40
	Control Stress	59.9000	10.09646	40
	Total	42.7958	18.94950	240

Fig 4. 2: Descriptive Statistics for MANCOVA

In the case of the Standard Deviation values, the results reveal that the post Aerobics group for both Stress (SD= 15.620) and Anxiety (SD= 17.727) were the highest among all, which when compared with the previous t-tests analysis, shows similar results as before (highest deviations found in post- Aerobics for both Stress and Anxiety). Hence, it can be confirmed that Aerobics group showed maximum deviation in the post-intervention period. Further analyses of the SD values reveal that the Yoga groups' values showed minimum deviation, further contributing to the case of effectiveness of Yoga on both Stress and Anxiety.

The Multivariate Tests performed for this data revealed different multivariate outcome values as well as the corresponding significance values for all the different test statistics performed. (Table 4.5).

These outcome values reveal the degree of variance of the mean values for the independent variables against both the dependent variables (Kim and Timm 2006). The different multivariate statistics all signify different values, since they are calculated differently, and hold true under different fulfillment of the MANCOVA assumptions. Since the significance values of all the tests statistics are below .005 (.000), all of them are valid for the current analysis and that the co-variants adjust for the outcomes. The Wilks' Lambda value (.310) , the most widely used value, in this case has a very high significance value (.000) and is also an exact statistic, and was hence considered for further inference purpose. Wilks' Lambda in the multivariate statistical tests determines the interaction effect of the intervention and is generally preferable over other values when more than 2 groups are involved, as in this case (Mayers 2013). In the current case, the high significance of Wilks' Lambda determines that the effect of Yoga and Aerobics on and Stress and Anxiety are not similar, thereby corroborating the t-test observation that Yoga is more effective than Aerobics on both Stress and Anxiety. Both Pillai's Trace and Hotelling's Trace are used when only two groups are involved and hence cannot be used or compared for the present scenario.

Table 4.5: Multivariate Test Statistics for MANCOVA

Effect	Value	F	Hypothesis df	Error df	Sig.
Intercept	Pillai's Trace	.986	8213.324[a]	2.000	233.000	.000
	Wilks' Lambda	.014	8213.324[a]	2.000	233.000	.000
	Hotelling's Trace	70.501	8213.324[a]	2.000	233.000	.000
	Roy's Largest Root	70.501	8213.324[a]	2.000	233.000	.000
TG	Pillai's Trace	.708	25.620	10.000	468.000	.000
	Wilks' Lambda	.310	37.153[a]	10.000	466.000	.000
	Hotelling's Trace	2.175	50.457	10.000	464.000	.000
	Roy's Largest Root	2.149	100.579	5.000	234.000	.000

a: Exact Statistics

Comparing the mean values of the Pre and Post interventions of the different Training groups, it can be observed that Yoga showed maximum effect on both Stress (pre= 61.95, post= 23.425) and Anxiety (pre= 64.00, post= 22.65) as compared to Aerobics and Control. This observation is in tandem with the previous findings of Yoga being more effective than Aerobics or no intervention for Stress and Anxiety. The mean values of the Control group for both Stress and Anxiety show little difference in pre and post intervention values, suggesting that a lack of intervention did not change stress and anxiety levels in the sample.

Finding 2:
The overall inference of MANCOVA test revealed that when the dependent variables were tested for simultaneously, with respect to the independent variables, Yoga was a better intervention program than Aerobics or no- intervention, on the stress and anxiety levels of the sample students studied.

ANCOVA Test
This test is performed when outcomes for single dependent variable needs to be assessed, while controlling for the covariates involved(Mayers 2013). In the previous test, both the dependent variables were tested simultaneously, and the multivariate tests values revealed significance for all the variables. This test shall delve deeper by assessing the dependent variables separately, to understand the outcomes better, by comparing the pre and post interventions. First, ANCOVA is performed for the dependent Stress and Anxiety, separately and then combined and all the results analyzed.

Psychological Variable	Dependent Variable	Independent Variable
Stress	Post-Intervention	- Pre-Intervention - Training Groups (Control, Yoga, Aerobics)
Anxiety	Post-Intervention	- Pre-Intervention - Training Groups (Control, Yoga, Aerobics)
Combined	Post-Intervention	- Pre-Intervention - Training Groups (Control, Yoga, Aerobics)

ANCOVA Test for Stress
In the comparison of Between Subjects Effects (Table 4.8), the Dependent variable Post-intervention, shows high significance for its relationship with Pre-intervention and among all Training Groups (TG) since the p-value is less than .005. Furthermore, the adjusted mean values (Table 4.9) of post and pre comparison showed little difference which proves that not much error existed within the data. As a result, the overall ANCOVA test holds significant and true for the current comparison of all groups for dependent variable Stress, since the means have been adjusted for the pre interventions.

Table 4.8: Tests of Between-Subjects Effects for Stress-ANCOVA

Source	Type I Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	29038.860[a]	3	9679.620	88.600	.000
Intercept	216580.033	1	216580.033	1982.409	.000
Pre	2936.778	1	2936.778	26.881	.000
TG	26102.082	2	13051.041	119.459	.000
Error	12673.107	116	109.251		
Total	258292.000	120			
Corrected Total	41711.967	119			

a. R Squared = .696 (Adjusted R Squared = .688)

Table 4.9: Estimates for Stress-ANCOVA

Different Training Groups	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Yoga	23.453[a]	1.653	20.180	26.726
Aerobics	44.571[a]	1.656	41.292	47.850
Control	59.426[a]	1.656	56.146	62.706

a. Covariates appearing in the model are evaluated at the following values: pre = 62.0000.

Pairwise comparison of the different training groups (Table 4.10) (post and pre difference) showed that the differences between the adjusted means previously seen (Table 4.8) lie within all the groups comparison, since all of them show a very significant p-value (p< .005). As a result, it can be proved that overall that the ANCOVA test for Stress dependent variable held significant across all groups and can be co-related to the findings of MANCOVA for comprehensive inference.

Table 4.10: Pairwise Comparisons for Stress-ANCOVA

(I) Different Training Groups	(J) different training groups	Mean Difference (I- J)	Std. Error	Sig.[a]	95% Confidence Interval for Difference[a]	
					Lower Bound	Upper Bound
Yoga	Aerobics	-21.118*	2.339	.000	-25.751	-16.486
	Control	-35.973*	2.340	.000	-40.607	-31.339
Aerobics	Yoga	21.118*	2.339	.000	16.486	25.751
	Control	-14.855*	2.346	.000	-19.501	-10.209
Control	Yoga	35.973*	2.340	.000	31.339	40.607
	Aerobics	14.855*	2.346	.000	10.209	19.501

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

ANCOVA Anxiety
In this test, the effect of the independent variables is studied for the dependent variable, Anxiety for comparison between Pre and Post intervention, especially assessing their significance. The Between Subjects Effects analysis, (Table 4.11) which describes the significance of the entire ANCOVA test when the values as adjusted for the covariate values (values of the Control group considered as a baseline), in the current case showed high significance (p< .005) for all the training groups but no significance for the pre-intervention comparison (p= .808). This can be inferred as the pre and post intervention of all groups for Anxiety is not significantly different in its values when adjusted with the covariate value. Further observance of the adjusted mean values (Table 4.12) shows that little difference existed between the original and adjusted values. Overall, it can be inferred that the ANCOVA test to study pre and post intervention in different training groups for the dependent variable, Anxiety holds significant.

Table 4.11: Tests of Between-Subjects Effects for Anxiety-ANCOVA

Source	Type I Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	29876.763[a]	3	9958.921	81.304	.000
Intercept	222999.408	1	222999.408	1820.553	.000
Pre	7.284	1	7.284	.059	.808
TG	29869.479	2	14934.739	121.926	.000
Error	14208.829	116	122.490		
Total	267085.000	120			
Corrected Total	44085.592	119			

a. R Squared = .678 (Adjusted R Squared = .669)

Table 4.12: Estimates for Anxiety-ANCOVA

Different Training Groups	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Yoga	21.465[a]	1.784	17.931	24.999
Aerobics	47.732[a]	1.768	44.231	51.234
Control	60.128[a]	1.753	56.657	63.599

a. Covariates appearing in the model are evaluated at the following values: pre = 61.5917.

Pairwise comparison (Table 4.13) analysis show that the differences for all the groups in pre and post comparison are highly significant (p< .005), which when compared with the previous results of mean adjusted (Table 4.11) further corroborate the significance for the different training groups as well as pre and post values. Overall, the ANCOVA test for the dependent variable Anxiety, held true and significant, when the pre and post variables across all the training groups were compared.

Table 4.13: Pairwise Comparisons for Anxiety-ANCOVA

(I) Different Training Groups	(J) Different Training Groups	Mean Difference (I- J)	Std. Error	Sig.[a]	95% Confidence Interval for Differencea	
					Lower Bound	Upper Bound
Yoga	Aerobics	-26.267*	2.546	.000	-31.311	-21.224
	Control	-38.663*	2.514	.000	-43.643	-33.683
Aerobics	Yoga	26.267*	2.546	.000	21.224	31.311
	Control	-12.396*	2.480	.000	-17.307	-7.485
Control	Yoga	38.663*	2.514	.000	33.683	43.643
	Aerobics	12.396*	2.480	.000	7.485	17.307
Based on estimated marginal means						

ANCOVA Combined

This test combined for both the dependent variables, Anxiety and Stress and compared the pre and post intervention values for the adjusted covariate values, across all the training groups. The Between Subjects analysis (Table 4.14) showed high significance for all the comparisons, that is, pre and post and across all the training groups (p<.005) such that the adjusted differences in the mean values are held true and significant. Furthermore, the comparison of the differences in the mean values of original and adjusted show little differences (Table 4. 15), due to the effect of the covariates. Overall, the ANCOVA test for the combined effect of the dependent variabl Stress and Anxiety on different training groups when compared for their pre and post intervention values held significant and true, thereby corroborating with the results of the individual ANCOVA tests of Stress and Anxiety.

Table 4.14: Tests of Between-Subjects Effects for Combined-ANCOVA

Source	Type I Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	58925.087[a]	6	9820.848	85.078	.000
Intercept	439556.004	1	439556.004	3807.886	.000
Pre	1724.429	1	1724.429	14.939	.000
TG	57200.658	5	11440.132	99.106	.000
Error	26895.909	233	115.433		
Total	525377.000	240			
Corrected Total	85820.996	239			
a. R Squared = .687 (Adjusted R Squared = .679					

Table 4.15: Estimates for Combined-ANCOVA

Different Training Groups	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Yoga Anxiety	21.485[a]	1.711	18.114	24.857
Aerobics Anxiety	47.903[a]	1.709	44.537	51.269
Control Anxiety	60.260[a]	1.701	56.909	63.611
Yoga Stress	23.344[a]	1.699	19.996	26.691
Aerob Stress	44.440[a]	1.700	41.091	47.789
Control Stress	59.343[a]	1.702	55.990	62.696
a. Covariates appearing in the model are evaluated at the following values: pre testing = 61.7958.				

Finding 3:

The Pairwise comparison (Table 4.16) analysis showed the comparison of the mean values for different training groups, and proved to be highly significant across all sets of comparisons (p< .005) except when compared within the same dependent variable (Yoga Anxiety- Yoga Stress, Aerobic Stress- Aerobic Anxiety, etc.). This insignificance within the same group could be due to the fact that for both the dependent variable, same sample population is analyzed for a single independent variable (Yoga or Aerobics). Overall, the adjusted differences found earlier were held significant in most of the cases, on account of the covariate influence and the ANCOVA test held true and significant for the combined testing of both dependent variables Stress and Anxiety across all training groups in pre and post interventions.

Table 4.16: Pairwise Comparisons for Combined-ANCOVA

(I) Different Training Groups	(J) Different Training Groups	Mean Difference (I-J)	Std. Error	Sig.[a]	95% Confidence Interval for Differencea	
					Lower Bound	Upper Bound
Yoga Anxiety	Aerobics Anxiety	-26.418*	2.434	.000	-31.213	-21.623
	Control Anxiety	-38.775*	2.420	.000	-43.542	-34.008
	Yoga Stress	-1.858	2.410	.441	-6.607	2.890
	Aerobics Stress	-22.955*	2.417	.000	-27.716	-18.193
	Control Stress	-37.858*	2.405	.000	-42.596	-33.120
Aerobics Anxiety	Yoga Anxiety	26.418*	2.434	.000	21.623	31.213
	Control Anxiety	-12.357*	2.405	.000	-17.094	-7.620
	Yoga Stress	24.560*	2.410	.000	19.811	29.309
	Aerobics Stress	3.463	2.406	.151	-1.276	8.203
	Control Stress	-11.440*	2.419	.000	-16.205	-6.674
Control Anxiety	Yoga Anxiety	38.775*	2.420	.000	34.008	43.542
	Aerobics Anxiety	12.357*	2.405	.000	7.620	17.094
	Yoga Stress	36.917*	2.404	.000	32.180	41.654
	Aerobics Stress	15.820*	2.403	.000	11.087	20.554
	Control Stress	.917	2.409	.704	-3.829	5.664
Yoga Stress	Yoga Anxiety	1.858	2.410	.441	-2.890	6.607
	Aerobics Anxiety	-24.560*	2.410	.000	-29.309	-19.811
	Control Anxity	-36.917*	2.404	.000	-41.654	-32.180
	Aerobics Stress	-21.096*	2.403	.000	-25.832	-16.361
	Control Stress	-35.999*	2.404	.000	-40.736	-31.263
Aerobics Stress	Yoga Anxiety	22.955*	2.417	.000	18.193	27.716
	Aerobics Anxiety	-3.463	2.406	.151	-8.203	1.276
	Control Anxiety	-15.820*	2.403	.000	-20.554	-11.087
	Yoga Stress	21.096*	2.403	.000	16.361	25.832
	Yoga Anxiety	37.858*	2.405	.000	33.120	42.596
	Aerobics Anxiety	11.440*	2.419	.000	6.674	16.205
	Control Anxiety	-.917	2.409	.704	-5.664	3.829
	Yoga Stress	35.999*	2.404	.000	31.263	40.736
	Aerobics Stress	14.903*	2.407	.000	10.160	19.646
Based on estimated marginal means						
*. The mean difference is significant at the .05 level.						
a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).						

Discussion of Findings

The primary data collected through the survey from 120 students of an engineering college were analyzed using several statistical tools through the software, SPSS 21.0, which included the Paired sample t-test, correlation, MANCOVA and ANCOVA tests. This chapter attempted to answer the research questions, regarding the differences in the effect of Yoga and Aerobics as an intervention on the Stress and Anxiety levels of college students. The paired sample t-test analysis revealed that Yoga was comparatively more effective than Aerobics over Stress and Anxiety both as seen from the mean values as well as means Differences values of the Paired Samples t-test. In the case of MANCOVA, Yoga was found to be a better intervention program than Aerobics, on the stress and anxiety levels of the sample students, with controlling for the baseline values from Control group values. Lastly, in case

of ANCOVA, individual tests for both the dependent variables Stress and Anxiety as well as combined test of both the variables, revealed that the adjusted values (using the Control group baseline values) showed not much difference and the tests held true and significant.

Result

The primary data collected through the survey from 120 students of an engineering college were analyzed using several statistical tools through the software, SPSS 21.0, which included the Paired sample t-test, correlation, MANCOVA and ANCOVA tests. The paired sample t-test analysis revealed that Yoga was comparatively more effective than Aerobics over Stress and Anxiety both as seen from the mean values as well as means Differences values of the Paired Samples t-test. In the case of MANCOVA, Yoga was found to be a better intervention program than Aerobics, on the stress and anxiety levels of the sample students, with controlling for the baseline values from Control group values. Lastly, in case of ANCOVA, individual tests for both the dependent variables Stress and Anxiety as well as combined test of both the variables, revealed that the adjusted values (using the Control group baseline values) showed not much difference and the tests held true and significant.

Conclusion

Primary analysis, as presented in Chapter 4 depicted a positive effect of Yoga and Aerobics on the Stress levels of the students surveyed, as compared to the values of the Control group. However, between Yoga and Aerobics, Yoga was significantly more effective than Aerobics on the stress levels, as shown in the Paired Sample t-test and MANCOVA analysis results. For the purpose of controlling the effect of a covariance, the values of the control group provided as a baseline, were tested in ANCOVA and MANCOVA. It was determined that the differences in the mean values (original and adjusted) were significant and the tests held true, thereby improving the overall reliability of the study findings. Stress is an integral part of academia, where it interferes with the students' performance, alertness, abilities, and, concentration (Hystad, Eid, and Laberg 2009). A previous literature review study of the comparative effects of Yoga and Aerobics have shown that, maximum studies reported Yoga being more beneficial than the alternative form of exercise (Ross & Thoms, 2010). With respect to stress in academia, Yoga has been shown to have positive effect in school students such that their academic performance and alertness improved considerably by performing regular yoga asanas, pranayama and meditation (Kauts & Sharma, 2009).

As a result, the current findings this question, the MANCOVA and ANCOVA tests were performed, wherein the Control group values acted as a covariate, thereby controlling for the extraneous variations observed in the correlation studies. Both MANCOVA and ANCOVA corroborated with the initial findings and with that of eminent literatures, that Yoga was significantly more effective than Aerobics in decreasing the Stress among the engineering college contribute to the existing research, students. with specific emphasis on students As a result of Primary undergoing professional courses, where the demands, pressures and expectations are very high.

However, the contradictions in the findings of the low correlation values for both Yoga and Aerobics as compared to highly significant correlations for Control groups presented with doubts regarding the effectiveness of the research methodology. In order to address analysis of data obtained from the survey, it was evident that both Yoga and Aerobics has a positive impact on the Anxiety levels of the students of the engineering college. However, when the t-test results between Yoga and Aerobics were compared, Yoga showed more positive impact on Anxiety than Aerobics, which was further corroborated with the MANCOVA and ANCOVA results. However, contradictions were observed on the effect of Yoga and Aerobics on the Anxiety levels, in the Paired sample t-test correlations test performed, such that the correlations values for both Yoga and Aerobics were negative as compared to earlier findings of Yoga and Aerobics both showing significant positive effect on the Anxiety levels.

REFRENCES

BOOK

1. Mathew Donald K. s, Measurement in Physical Education, (Philadelphia: W.B. Saunder"s Company, (1978),5 .

2. Singh Ajmer, Modern Text Book of Physical Education, Health and Sports, (Noida: Kalyani Publishers, (2000),16- 17.

Journals and Periodicals

3. Abernethy B. (1990), "Anticipation in Squash : Differences in Advance Cue Utilization Between Expert and Novice Players". Journal of Sports Science, 8(1):17-34.

4. Abernethy, B.,(1990)"Expertise, Visual Search, and Information Pick- up in Squash" Perception, 19 (1) :63-77.

5. Bajpai Mishra's Vinita work titled "Role of Information Technology in Sports Management", International Journal of Physical Education and Sports Sciences, 1

6. Bing Wei Et. Al. 2006 "Psychological Perceptions to Walking, Water Aerobics And Yoga In College Students", American journal of Health Studies, 21(3):142-148

7. Chan T.C., Turvey M.T. (1991), "Perceiving the Vertical Distances of Surfaces by means of Hand-held Probe", Journal of Exp. Psychol. Hum Percept Perf orm, 17(2):347-358.

8. Classé JG, Semes LP, Daum KM, Nowakowski R, Alexander LJ, WisniewskiJ, Beisel JA, Mann K, Rutstein R, Smith M, Bartolucci A. (1997) "Association between visual reaction time and batting, fielding, and earned run averages among players of the Southern Baseball League". J Am Optom Assoc, 68(1):43-9.

9. Dave Malay, Dhavale's H.S. (1 9 9 9), "A Comparative Study of Psychological Factors in Patients with Normal and Abnormal Angiographic Findings", Indian Journal Psychiatry, 41(4): 314–319

10. Davranche K., Audiffren M. (May'2004) "Facilitating Effects of Exercise on Information Processing", Journal of Sports Science, 22(3):419-28

11. Davranche K., Audiffren M. and Denjean A. (2006)., "A Distributional Analysis of the Effect of Physical Exercise on a Choice Reaction Time Task", Journal of Sports sciences, 24(3):323-9.

12. Denis John Glencros (1995), "Analysis of information processing, decision making, and visual strategies in complex problem solving sport situations" Human Movement Science, 14(1): 133-135

13. Grandy M.S. Westwood D.A, (2006), "Opposite Perceptual and Sensory-motor Responses to a Size-Weight Illusion", Journal of Neurophysiology, 95(6) : 3887-3892

14. Harvey S. Levin, Ph.D., Stephen C. Lippold, Ph.D., Arnold Goldman, M.D., Stanley Handel, M.D., Walter M. High, Jr., M.A., Howard M. Eisenberg, M.D., and David Zelitt, B.S., (1987) "Neurobehavioral functioning and magnetic resonance imaging findings in young boxers", Journal of Neurology,67(5):657-667

15. Hesse C, Franz VH (2009). "Corrective processes in grasping after perturbations of object size" Journal of Motor Behavior. 41(3):253-73Ho YX, Serwe S, Trommershäuser J, Maloney LT, Landy MS (2009) "The role of visuohaptic experience in visually perceived depth". J Neurophysiol,101(6):2789-801

16. Ichikawa M.(2009) "llusory temporal order for stimuli at different depth positions". Atten Percept Psychophys.;71(3):578-93

17. Janet (2005). Yoga for depression: the research evidence. Journal of Affective Disorders, 89 (1-3):13-24.

18. Kadhiravan's Vasanthi,(2011), "A Comparative Study of Psychological variable between Sportspersons and Non-Sportspersons", ISRJ Journal of physical Education, I(19)

19. Kingma I, Savelsbergh G.J., Tousaint H.M. ,(1999), "Object Size Effects on Initial Lifting Forces under Microgravity Conditions", Experiments Brain research, 124(4):422-8.

20. Kioumourtzoglou E., Derri V., Tzetzis G., Theodorakis Y. (1998), "Cognitive, Perceptual, and Motor Abilities in Skilled Basketball performance", Perceptual Motor Skills, 86(3 pt 1):771-86.

21. Kyeongra Yang's work titled "Yoga Programs for Four Leading Risk Factors of Chronic Diseases", Based Complement Alternate Med, 4(4): 487–491.

22. Laby D.M., Rosenbaum A.L., Kirschen D.G., Davidson J.L., Rosenbaum L.J., Strasser C., Mellman M.F., (1996) "The Visual Function of Professional Baseball Players". Am J Ophthalmol, 122(4):476-85.

23. Lidor R., Argov E., Daniel S., (1998), "An Exploratory Study of Perceptual- Motor Abilities of Women: Novice and Skilled Players of Team Handball", Perceptual Motor Skills, 86(1):279-288.

24. McLeod P., (1987),"Visual Reaction Time and High-Speed Ball Games", Perception,16(1):49-59

25. McMorris T., Hill C., Sproule J., Potter J., Swain J., Hobson G., Holder T. (2005), "Supra-Maximal Effort and Reaction and Movement Times in a Non- Compatible Response Time Task", Journal of Sports Medical Physical Fitness, 45(1):127-33.

26. Moriarity J. , MD, A. Collie, PhD, D. Olson, MD, J. Buchanan, DO, P. Leary, DO, M. McStephen, Grad Dipl Computing and P. McCrory, MBBS PhD, (2004) "A prospective controlled study of cognitive function during an amateur boxing tournament",American Academy of Neurology, 62:1497-1502.

27. Oesen S., Bachl N., Baron R. (2015) "Assessment of aerobic and anaerobic power as reference values in older aged women", Medicina dello Sport,68(4):541-54

28. Proffitt D. R, Stefanucci J., Banton T., & Epstein W. (2009) "The various perceptions of distance: an alternative view of how effort affects distance judgments" J Exp Psychol Hum Percept, 35(4):1104-17.

29. Savelsbergh G.J., Van der Kamp J., Williams A.M., Ward P. (2002), "Anticipation and Visual Search Behaviour Expert in Soccer Goalkeepers" Journal of Sports Sciences, 20(3):279-87.

30. Segal N.,J.Hein,J.Basford's, (2004)"Effects of pilates training on flexibility and body composition", Archives of Physical Medicine and Rehabilitation, 85(12):1977-1981.

31. Shim J., Carlton L.G., Chow J.W., Chae W.S.(March'2005), "The Use of Anticipatory Visual Cues by Highly Skilled Tennis Players". Journal of Motor Behavior, 37(2):164-75.

32. Solomon H.Y., Turvey M.T. (1988), "Haptically Perceiving the Distances Reachable with hand-held Objects", Journal of Exp. Psychol. Hum. Percep. Perform, 14(3):404-27

33. Williams A.M., Davids K.,(1998), "Visual Search Strategy, Selective Attention, and Expertise in Soccer", Research Quarterly Exercise Sports, 69(2):111-28

34. Williams A.M., (2000), "Perceptual Skill in Soccer : Implications for Talent Identification and Development",J Sports Science, 18(9):737-50

35. Williams A.M., Davids K., (1998) "Visual Search Strategy, Selective Attention, and Expertise in Soccer" Res Q Exerc Sport, 69(2):111-28.

36. Williams A.M., Davids K., Burwitz L., Williams J.G. (1994), "Visual Search Strategies in Experienced and Inexperienced Soccer Players", Research Quarterly Exercise Sports, 65(2):127-35